Technical Information

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Two serious defects in ordinary polarised electrolytic capacitors (wet type, dry type).

Quality of a capacitor depends on whether its dielectric is good or not. Electrolytic capacitors using an aluminum oxide, which is most excellent dielectric or earth, should be, therefore, ranked at the top of the electrolytic capacitors.

However, they have two serious defects.

First, having no definite means for providing a cathode electrode with a lead wire, a large amount of nonlinear distortion (noise) is generated from an electrolyte and structural parts. This is because a signal is led out through the electrolyte which is impregnated in a separator and is 20,000 times as thick as the aluminum oxide film.

Second, a part of signal is emitted outside since a cathode electrode is dare to adopt a structure without any oxide film (a polarised structure) avoiding breaking down of the cathode electrode by striking of direct current ions.

In electrolytic capacitors of the dry type, fundamentally, only a polarised structure can be produced. Therefore, every wet and dry type of ordinary electrolytic capacitors have been seriously affecting circuits from the beginning.

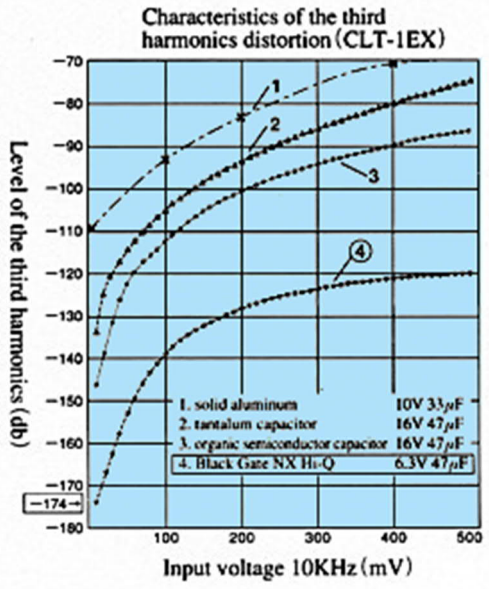
Showing up of The Transcendence Election Transfer based on the tunnel effect.

It has been a long desire in the world to remove the above defects of polarised one, so it is necessary to achieve a complete non-polarised electrolytic capacitor having an eternal oxide film at the cathode electrode as well as at the anode electrode. It has been, however thought to be almost impossible. As is

well known, an electrolytic
capacitor comprises electrode foils, an electrolyte and a separator. With respect to the former two elements, many improvements have been made, however, neither of them contributes directly to the performance of the capacitor itself.

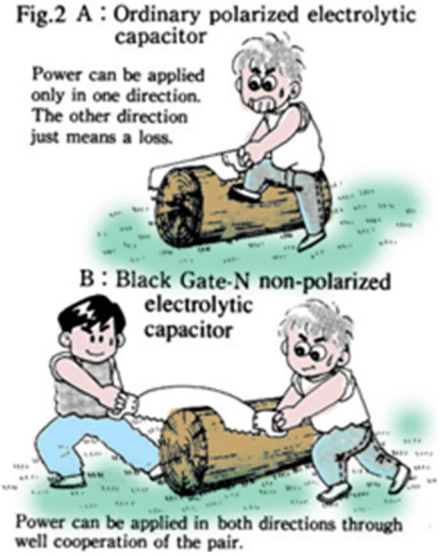
Therefore, Jelmax introduced into the third element, separator conductive line particles, which are 100,000 times as much as ordinary against common knowledge that the separator must be highly pure based on an unreasonable custom-It was exactly the remarkable feat that we achieved. The tunnel effect has happened in the separator that is an unexpected great change. With this tunnel effect, electrons are separated from ions and are transferred turning their transmission type from ion transfer to The Transcendence Electron Transfer at ultra high speed. With respect to frequency characteristics, 10GHz have been achieved which are 100,000 times as high as that of conventional capacitors-

Fig.1 Distortion characteristics of various capacitors



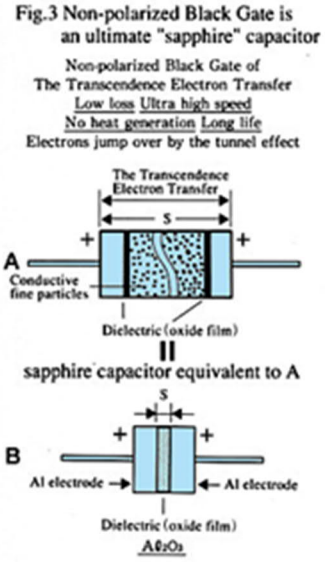
Ordinarily, when the electrons flow through common conductors such as an electrolyte, a manganese dioxide, an organic semiconductor and so on, non-linear distortions generate corresponding to each conductor (average -100db) as shown in Figure 1 which indicates distortion characteristics. However, in the case of Black Gate, the distortion showed such a surprising low value (-174db) as if no electrons flew. The distortion noise was almost zero. Taking the results into consideration, electrons must have jumped over the separator by the tunnel effect. As a matter of course, no heat generation of conducting material took place. The shortcoming that the life is short and that is peculiar to an ordinary electrolytic capacitor has completely disappeared too.

Fig.2 A : Ordinary polarized electrolytic capacitor



Since there is very few obstacles in a path along which the electrons flow, the power transmission efficiency increases by five times as high as that of conventional capacitors Moreover, the structure of the Black Gate is non-polarised, so it makes the above efficiency even higher than that of an ordinary polarised electrolytic capacitors with only a single pole as shown in Figure 2.

Fig.3 Non-polarized Black Gate is an ultimate "sapphire" capacitor



Breakdown of the cathode oxide film was completely ceased by The TranscendenceElectron Transfer. At last a definitely non-polarised capacitor has been completed which has been desired all over the world - as described, the ion transfer has disappeared and the movement of ions has been stopped by The Transcendence Electron Transfer. The cathode electrode is created which has the same structure as the anode electrode and which has a symmetric structure with respect to the electric operation as shown in Figure 3A. The distance S between the electrodes becomes substantially zero due to the tunnel effect. Therefore, as shown in Figure 3B, the capacitor is definitely non-polarised and its dielectric has the same property as a sapphire. Finally, a long awaited sapphire capacitor has been thus realised for the first time in the world. As expected, property of the capacitor is superior to all the capacitors including a film capacitor, a ceramic capacitor, a tantalum capacitor, an organic semiconductor capacitor and others.

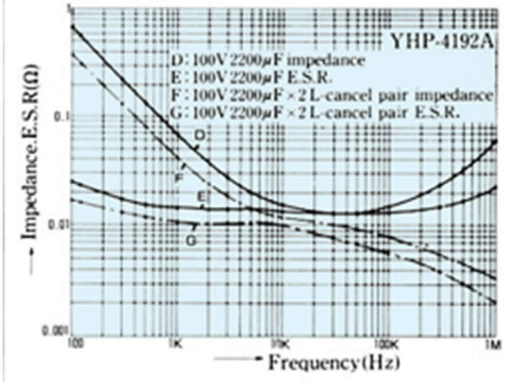
The list of cathode electrode formation voltage for the whole Black Gate products

Fig.4. Cathode electrode formation voltages for the whole Black Gate Products

Products	Cathode electrode formation voltage (V)
BG standard,BG-PK,C	2.0
BG-FK,BG-VK,K	10
BG-WK	100
BG-WKZ 350V	160
BG-WKZ 500V	250
BG-AC,BG-N BG-NX,BG-NH	Same as anode, complete non-polarized

A formation voltage for cathode electrode oxide film of Black Gate can be selected to be an arbitrary value that is different from that of anode electrode. Therefore, the voltages for cathode electrode formation of every Black Gate product are selected to be appropriate values for each of the whole products as shown in Figure 4, within which a non-polarised operation with very low distortion is secured. Moreover, all of the cathode electrode oxide films are permanent. For BG-WKZ 500V used for a tube amplifier, the voltage is selected as 250V. With this voltage, the amplifier maintains a complete non-distortion operation to the full power of A-class voltage amplification. This result is indeed a revolution.

Fig.5. Impedance and E.S.R. characteristics with respect to frequency.



Most difficult problem: influence of internal resonance

An electrolytic capacitor, consisting a rolled pair of aluminum electrodes set face to face, forms a specific resonance frequency between the inductance L element of the electrodes and its self capacitance. In this type of capacitor, it is impossible to eliminate resonance. Normally the resonance frequency is about 200KHz at 100 µF, about 70KHz at I000µF, and about 35KHz at 2200µF. These values apply almost equally to capacitors of the same capacitance per area, whether polarised or non-polarised.

As the impedance and E.S.R. characteristic curves D and E in Figure 5 shows, the BG-N (100v 2200µF) has a resonance point around 35KHz. With this as the turning point, the impedance and E.S.R. Increase as the frequency increases, causing the function of capacitor to stop. Also, at the-resonance point, the phase of the internal current changes drastically from negative to positive. That Is to say, the band above the resonance point is an imaginary part in any electronics product, if signals enter in this band, the impedance and phase change. Engineers design and make products without giving much consideration to this fact. Even if they are aware of this, there has been no effective remedial means of remedying this.

Canceling resonance frequency by using the characteristics of Black Gate-N

Jelmax has developed a new system which uses a pair of two BG-Ns of the same voltage and capacity in such a way that their internal inductance's (L) canceled each other by utilising the mechanical characteristic of the BG-N using a rolled pair of electrode foils of the same area and same mechanism set face to face, and thereby, allows the pair to function as a single ideal capacitor called Super E-Caps".

Fig. 6. Principle of BG-N Pair Super E-Caps.

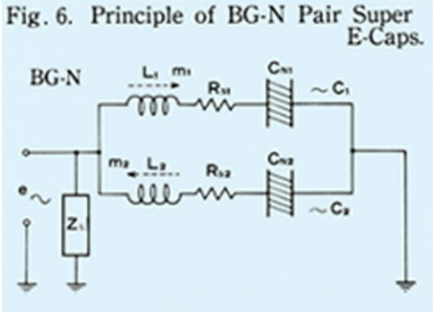
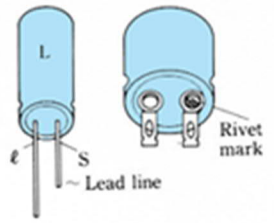


Figure 6 shows how this works. Two non-polarised capacitors BG-N C, and C: have their respective inner capacities C_{N1} and C_{N2} equivalent series resistance E.S.R elements R_{S1} and R_{S2} very small inductance's L1 and L_2 resulting from the internal electrode foil roll, and resonance frequencies each other Inductance's L_1 and L_2 generate magnetic fluxes m_1 and m_2 Since both electrodes of BG-Ns of the same specifications are the same and symmetric in mechanism and size, with their rolls start and end at the same positions. Suppose signal o is applied to a pair of the same BG-Ns corrected in parallel. If magnetic fluxes m_1 and m_2 are in such a relation that they are canceled with each other as shown in the figure, the total resonance frequency disappears in load Z_L. The pair of the BG-Ns leaves nothing but CN1 and C_{N2}, serving as an ideal capacitor allowing the Impedance and E.S.R to lower infinitely as the frequency increases. This can be attained only by the BG-N Pair. Hence it's naming of "Super E-Caps".

This is also shown in Figure 5 In the BG-N Pair, the capacity is twice as large as and the E.S.R. is half as small as those of a single BG-N. In addition, as a result of the elimination of resonance frequency, the impedance and E.S.R. lower infinitely as the frequency increases

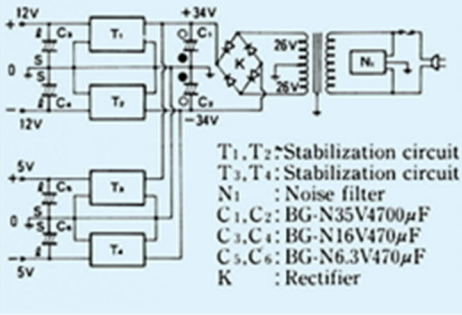
Fig. 7. Markings of foil roll starting and ending positions in BG-N and BG-NX.



Marking to show the starting and ending positions of a foil roll

The BG - N and BG - NX are always manufactured in the same manner as shown in Figure 7, each product shows the toil roll starting and ending positions by means of lead lines of different lengths or by the marking of O and × on the terminal rivets. These allow users to connect these capacitors in parallel or in series as needed to cancel the resonance frequency due to residual inductance.

Fig. 8. ±2 power supply Super E-Caps L-Cancel Pair circuit



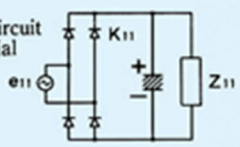
Sample power supply circuits using Super E-Caps

Figure 8 gives a sample ± 2power supply "Super E-Caps" L-Cancel Pair circuit widely used for IC power supplies it is a power supply of 12V and 5V. C_1 to C_6 are BG-Ns. Correcting them as shown in the figure based on the rivet marks and/or lead line lengths forms an ideal power supply for very high-speed, high-density information processing meeting the requirements for a very low level of noise and a very high speed.

Fig. 9. Parallel L-Cancel Pair power supply circuit.

Figure 9 is a parallel L-Cancel Pair power supply circuit diagram just shown in Figure 6 'principle of BG-N pair Super E-Caps'. The alternating voltage or the secondary side is rectified, causing DC output to be generated at BG-N C_1 and C_2 and also 12V DC output to be generated at BG-N C_3 and C_4 on the output side of The stabilisation circuit T_1. When an alternating supply on the secondary side is to be given as intermittent high frequency pulse voltage it is a switching power supply and its applications are numerous. This type of circuit can keep the level of residual ripple-noise down to several mV. The BG-N permits making the world's first completely noiseless switching power supply.

Fig. 10. Direct rectifier circuit for the commercial power source



Completion of high voltage Super E-Caps and application to a direct power source rectifier circuit

A direct current having a voltage over l00v is used in switching power source, TV sets, inverter ballast devices for lighting apparatuses and so on.

A method widely supported for obtaining such a direct current applied to a load Z11 from a commercial power source is using a circuit as shown in Figure 10 which is recognised as the standard for a capacitor input type.

Taking above situation into consideration, Jelmax has succeeded in the development of a high voltage, non polarised Black Gate Super E-Caps BG-NH which can be operated over 100v to 350v corresponding to commercial power source voltage all over the world in addition to low voltage Super E-Caps of below 100v which is already developed by Jelmax.

In the first step, a non-polarised Black Gate was developed having completely symmetrical characteristics even in a high frequency band using a pair of equal electrodes and a newly developed separator.

In the second step, a pair of the non-polarised Black Gate capacitor were arranged in Super E-Caps connection so that an unconventional high voltage Super E-Caps is created which operates even In GHz band with ideal characteristics. At this moment, a complete noiseless operation has been achieved at every voltage and in every frequency band. Thus, completely noise-less direct current can be supplied to the load Z12 for the first time as shown in Figure 11.

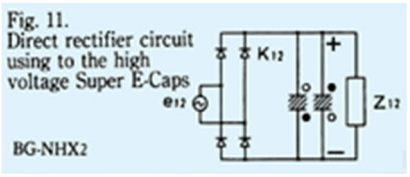


Fig. 11.
Direct rectifier circuit using to the high voltage Super E-Caps

Moreover, Super E-Caps eliminates the internal resonance which has been unavoidable by all the conventional capacitors - As a result, even the problem that a pulse time interval is changed while a digital signal passes through a power source is now solved at the same time. This also means that an ideal power source has been completed for the first time in the world. See USP 5,379,181 issued on January 3 1995.

In summary above, the main features of Super-E Caps are as follows:

- An electron transfer
- A completely non-polarised capacitor
- No limitation to operation frequency
- No ripple noise a Long life
- No digital phase change
- Small size, light weight
- Cost saving
- Providing a power source completely free from any restriction.

Other use of Super E-Caps than for the power source

Since Super E-Caps shows an ideal capacitor characteristics which conventional ones do not have, it car be used for every circuit other than the power source with advantages which has not been realised before Main uses of Super E-Caps are listed below.

For an AC grounding in such circuit having IC potentials as cathode, emitter and decoupling by-pass circuit, the best grounding effect can be realised. For these purposes, parallel L canceled pair connection is most effective.

In audio and video frequency band or even in HF gigahertz band, it shows various advantages which ceramic or mica capacitors do not have, thus makes the S/N improve. Its application into the feedback loop of negative feedback amplifier (NF amplifier), eliminates phase change and makes amplifier highly stable.

By applying Super E-Caps to an oscillating loop of C-R oscillation circuit, oscillation of very low band frequency with low distortion oscillated signal is generated. By applying Super E-Caps to a frequency discriminator of FM receiver, a high fidelity detector is realised which has never been provided before

Moreover, by applying Super F-caps to a phase detector of a colour TV set, a Hi-Fi TV is realised having a colour tone of extremely high purity and stable characteristics. Thus, Super F-caps opens new world to high performance electronics one after another which are far beyond the limit of conventional capacitor and allows us to have limitless expectation

What Super E-Caps means

A capacitor C, a resistor and an inductance L which are basic parts of electronic circuits have become of high quality with the development of recent technology. Most of capacitor in components are, however, still occupied by polarised ion transfer type electrolytic capacitors. Those capacitors have been a

stumbling block which limits the improvement of the performance of electronic devices in every aspect including transmission rate, distortion, power, phase characteristic, operating band and durability compared with other electronic components.

USP 5,379,181 recently granted on the invention of Back Gate Super E-Caps means that those obstacle elements are all removed and that all the components have reached the highest quality. Electronic devices have, thus, made a revolutionary improvement for the first time.

With the opening of the 21st century is just around the corner, high quality devices using a digital transmission, multimedia systems and many other proposals are made in the worldwide bases. The electronic industry is expected to make progress which has never been attained. The invention of our Super E-caps is just timely granted because it can be applied to those devices and systems.

We firmly believe that the invention is a sole technology which is able to meet world-wide expectation in every field. We also believe that no other new technology will be able to substitute this pioneer invention using the combination of natural cellulose fibre and two elements of aluminum and graphite in coming 100 years

Effect of Super E-Caps in electronic equipment

Without exception, electronic equipment uses a lot of electrolytic capacitors serving as routes for the signals Even though the ion transfer and polarised mechanism produce a variety of distortions beyond expectation, the problem has yet to be resolved.

It has been common that even when a product delivers performance which is far less than expected, the maker continues designing and manufacturing equipment without thinking that the electrolytic capacitors used are the cause of the unsatisfactory performance.

Thanks to our product promotional activities, however, equipment makers employing the Black Gate have been increasing in number. In the area of CD players and DAC systems conducting digital signal, as the inventor companies completely switched to the use of the Black Gate, it has been attaining the dominating position. Its use in audio and communications equipment has also been spreading at home and abroad. It has become to be used in HDTV sets.

In the area of computers, the largest digital signal equipment, among others, it is absolutely necessary to provide very low-noise power supplies to meet the coming wave of very high-speed, very high-density capabilities. However, the existing switching power supplies, DC-DC converters and other driving power supplies are a hindrance because of their unsolvable noise problem. We believe that noiseless power supplies using the Super E-Caps would be a great boom to the world electronics market, bringing a revolutionary improvement to all electronic equipment involving digital signal processing.

Patent Registration

Japanese Patent	No.1,368,245		
New Japanese Patent	No. I,662.570		
U.S Patent	No.4,345,302	No.5,057,972	No.5,379,181
German Patent	No.2,900,742		
Trademark	No 1,601,800	No.1,601,801	

The Idling Process

If a Black Gate capacitor mounted on an electronic device is actuated, a signal current flows into it and the electrodes are gradually activated, reducing non-linear distortion and phase distortion substantially while improving the efficiency of power transfer efficiency.

The time required for this process varies widely with the capacity, voltage and signal level a total of about 30 hours is the standard level.

Once this process of idling is completed. The effect continues as long as the capacitor Is kept at the same place and the operating environment does not undergo a substantial change The effect of idling has been proved with all types of electronic equipment - analogue, digital, high-frequency and other devices.

It must be noted that idling is different from ageing, which applies a direct current voltage without giving signals.

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